interference of Prof. Julius Schmidt, the Director of the Observatory at Athens, whose elaborate lunar work is well known, that the complete publication of Lohrmann's charts has been effected. A pretty detailed prospectus has been circulated. The price of the entire work will be 2*l.* 10*s.*

THE PERIODICAL COMET, 1873 II.—The interesting comet of short period discovered by Tempel on July 3, 1873, was, it is understood, taken in hand by one of the able astronomers attached to the Observatory of Vienna, in which case an ephemeris may soon be expected. The last calculation of elements assigned a period of revolution of only 1,850 days, and it is possible that observations in November, 1873, may have indicated a still shorter period, so that the comet may again arrive at perihelion very early in the summer. Four days after the perihelion passage this comet makes a very near approach to the orbit of Mars, but the recent discovery of satellites to this planet detracts from the importance which would otherwise have attached to a study of the comet's motion, in the hope of eventually improving our knowledge of the planet's mass.

MINOR PLANETS.—Of all the members of this group the elements of which have been calculated, No. 153, *Hilda*, discovered by Palisa at Pola on November 2, 1875, makes by far the nearest approach to the orbit of Jupiter, and on this account it is desirable the planet should be kept under observation at successive oppositions. So far, it does not appear to have been recognised during the present one, though an ephemeris extending to February 20, was given in number 84 of the *Berlin Circular;* this will have been owing, no doubt, to its situation in a part of the sky for which we have no charts showing very small stars. According to the estimation made by Palisa on the night of discovery when the planet's distance from the earth was 3·22, and from the sun 4·20, its brightness at present will be equal to that of a star of the thirteenth magnitude. Subjoined is a continuation of the ephemeris deduced from the best orbit yet available, that by Kühnert, which is founded on observations from November 2 to December 30, 1875 :—

HILDA : AT GREENWICH MIDNIGHT.

		R.A.			N.P.D.		Dist. from Earth.
		h.	m.	s.	°	′	
February	28	7	57	36	78	49·2	3·723
March	2	7	56	57	78	44·5	3·760
,,	4	7	56	21	78	39·9	3·780
,,	6	7	55	48	78	35·3	3·801
,,	8	7	55	18	78	30·8	3·823
,,	10	7	54	52	78	26·5	3·845
,,	12	7	54	30	78	22·3	3·868
,,	14	7	54	12	78	18·1	3·893

Mr. W. Godward, of the *Nautical Almanac* Office, availing himself of the observations of Ceres which have been made at the Royal Observatory, Greenwich, at every opposition between 1857 and 1876, has corrected the elements of this, the first discovered of the small planets, and has succeeded in representing its course during the interval of about twenty years, with a precision which we do not remember to have seen attained in any previous investigation of the like nature. The residual errors in R.A. and declination in no case amount to five seconds of arc. Applying the corrections given by Mr. Godward in the *Monthly Notices* of the Royal Astronomical Society for January last, there result the following doubtless very exact elements of Piazzi's planet for 1878 :—

Epoch, 1878, November 16·0 G.M.T.

	°	′	″	
Mean longitude	47	50	24·5	
Longitude of perihelion	149	40	57·1	From M. Eq. of Epoch.
,, ascending node	80	47	43·1	
Inclination	10	37	17·9	
Angle of eccentricity	4	30	57·2	
Mean daily motion	771″·31117			

From the *Berlin Circular* No. 85, it appears that with the exception of the small planet observed by Prof. Peters on February 6, which proves to be *Antigone*, the planets lately observed are new. Their numbers and discoverers, with dates of discovery and magnitudes, are :—

No. 180	Perrotin	Jan. 29	12·0m.
No. 181	Cottenot	Feb. 2	10·0m.
No. 182	Palisa	Feb. 7	10·5m.
No. 183	Palisa	Feb. 8	12·0m.

As we anticipated, No. 180 proves to be distinct from *Urda*, which remains to be recovered.

BIOLOGICAL NOTES

THE ORIGIN OF THE CARBON OF PLANTS.—Mr. J. W. Moll has made in Prof. Sach's laboratory at Würzburg, some researches on this subject during the summer of 1876. A detailed account of these, with the conclusions at which he has arrived, is promised in the *Landwirthschaftliche Jahrbücher von Nathusius und Thiel*, but a brief account will be found in the last number of the *Archives Néerlandaises*, tome xii., 4me livre. A plant with green-coloured cells can, under the influence of light, take the carbon it requires from the atmosphere, releasing in the act of doing so, so much oxygen. This is a fact, too well vouched for by the experiments of Boussingault, Vogel, Rauwenhoff, and Harting, to admit of a doubt, but the quantity of carbon dioxide in our atmosphere is very small, and the quantity of carbon stored up during say a summer's growth in some large forest, is very great. Moreover, the roots of such plants are fixed in a soil which is highly charged with carbonaceous products, so the question quite naturally arises, may not the roots take up some of these atoms of carbon ready to their hand ? or may they not at least take up the carbon in the form of carbon dioxide, send this up the green granules in the leaves, and so give them a more abundant supply than they could get from the surrounding air ? Besides, is it not a fact that most plants seem to thrive in a fine rich leaf mould, and may not its richness in carbon be partly the cause ? One of the first questions Mr. Moll set himself to answer was—Can leaves decompose carbon dioxide which is furnished to the root of the stem from which the leaves spring ? Now, starting with assent to Prof. Sach's discovery that the starch of the chlorophyll granule is the first visible product of the fixation of some carbon atoms, there was here a ready method of proving whether this were so or not. In the course of several experiments it was contrived that leaves destitute of these starch granules should be in an atmosphere deprived of carbon dioxide, while at the same time they were well exposed to the influence of light. The roots were fixed in moist soil well supplied with carbon dioxide, and the result was that under these circumstances no starch granules were formed ; and in a modification of this experiment, where one portion of a leaf was allowed to be exposed to ordinary air, that portion at once set to forming its starch. Botanists no doubt will welcome the publication of the experiments of which we have now only the brief result ; doubtless more research will end in more discoveries in this most interesting field, for how can one account for the fact that some plants do, as we might say, fatten by feeding on carbon atoms, although these very plants cannot take these atoms when in union with oxygen ?

FERNS AND MOSSES.—Hofmeister's work on the "Higher Flowering Plants (Cryptogamia)" is truly indispensable to every scientific botanist, and, thanks to Mr. Curry, the English student has it at his command. It commences with an account of a not uncommon little plant called *Anthoceros lævis*, and it finishes with an account of those cryptogams very high in rank and vast in size, known to us as cone-bearers, and of which the churchyard yew or the giant Wellingtonia may serve as

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types. Of these cryptogams none are better known than the ferns and the mosses, and as the reader of Hofmeister's work, or, as we are but too glad to be able to add, of most of the very recent handbooks of botany, well know, both of these groups have this in common—that they pass, as it were, through two existences, one of which we may call the "fruit-bearing" stage (the sexual stage), and the other the "spore-bearing" stage (the a-sexual stage). The former of these two is the stage so apparent to us all in flowering plants, where, as a product of the fertilisation of the contents of the carpel by the pollen from the stamens, we have the fruit. In the ferns, as a rule, this first stage is one in which the plant, as it were, thinks only of producing its male and female cells, and the growth of the plant is lost in the care which it takes to continue the species. Shake a spore from the frond of some immense tree-fern, let it germinate, and the plant which will grow thereout will be a little green thing not so big as the top of one's thumb ; but it will form its "archegonium" and its "antheridium," and the contents of the latter fertilising the contents of the former, the result will be a plant which in time will equal the large tree-fern in size, but which at this, its great vegetative stage, will never produce aught but spores. In the mosses this state of things is different. The moss-stems which we gather as objects of beauty or use, these are the fruit-producing stages ; these concern themselves with growth as well as with what is usually antagonistic to growth, reproduction ; and in the second stage, which in the ferns is the only one popularly known, we have but a short-lived, small-sized, spore-producing plant, sometimes quite hid away in the lovely foliage of the moss plant, sometimes starting up from it, and then known popularly as its fruit, but really only its spore-producing stage. It is only very recently that Dr. Karl Goebel (*Botanische Zeitung*, October, 1877) has called attention to the development of the prothallium (sexual stage) of a delicate little fern called *Gymnogramme leptophylla*, which is to be found in Jersey, along both shores of the Mediterranean, and probably in all suitable localities in Africa, Asia, Australia, and South America. It and a few other species are annuals, so that at once we see that their a-sexual stage, which is also their vegetative one, is quite limited. Moreover, their little stems are often not more than an inch in height and the texture of the frond is almost pellucid. It thus approaches the mosses in the feebleness of this stage ; but the most interesting fact brought to light by Dr. Goebel is that the sexual stage, generally in the ferns so evanescent, is here absolutely somewhat long-lived, and more, that it is even somewhat vegetative, something like that of *Anthoceros lævis*. Such a form, which makes a bridge to thus connect the two groups (ferns and mosses), is of great importance, and Dr. Goebel's memoir, which is illustrated, is not only of great value from the accuracy of its details and from his deductions therefrom, but also as showing how much can be done even with apparently well-known forms.

PROF. GRIMM ON THE FAUNA OF THE CASPIAN.—We notice the appearance of the second part of Prof. O. A. Grimm's (Russian) work on the Aralo-Caspian Expedition. It is devoted exclusively to the Caspian and to its fauna, and contains the description of worms, sponges, and molluscs, discovered during the expedition, together with a general sketch of the vertical and horizontal distribution of Caspian molluscs. Prof. Grimm divides them into three regions, out of which the lowest one (deep sea) corresponds to older forms of fossils, whilst the upper one has its nearest relatives in youngest forms of fossils. In a concluding chapter Prof. Grimm discusses the interesting question as to the influence of conditions of life on morphological structure, and shows by many illustrations the accommodation of forms to varied conditions at different depths. The work is illustrated by many drawings.

TRANSFORMATION OF CARTILAGE INTO BONE.—The last *Bulletin* of the Belgian Academy of Sciences (vol. xliv. No. 11) contains a very valuable paper of Dr. Leboucq, Superintendent of Anatomical Researches at the University of Ghent, on the mode of formation of the bone tissue in the long bones of mammalians, in which the author discusses and resolves by his researches, based on a new principle, the much-debated question whether the embryonal cartilage is substituted by a new tissue, or is directly transformed into a bone. The great difficulty of rendering the minute cartilage cells apparent among other cells, is resolved by the author by his employing soda, and decalcifying the sections with acidulated glycerine ; the cells thus preserve their shape, and receive a beautiful colour, as is seen from a chromolithographed plate accompanying the paper. By using this method the author was enabled to prove that the minute cartilage cells take an active part in the formation of bones, quite performing the part of osteoblastes. The researches were carried out in the Ghent Laboratory, under the direction of Prof. van Bambecke, and the paper is accompanied by a very favourable comment thereon by Prof. van Beneden.

OWLS.—M. Alphonse Milne-Edwards has recently read before the Academy of Sciences of Paris two ornithological papers of interest. One on the affinities of the Owl, *Pholidus badius*, demonstrates, from its skeleton, that it belongs, quite contrary to the general opinion of naturalists, to the Bubonidæ, near to *Syrnium* and *Nyctale*, and not to the Strigidæ. In the species the posterior margin of the sternum has two pairs of well-developed notches, and the furcula is not complete at its symphysial extremity. This being the case, the genus *Strix* is now the only member of the family of the Strigidæ, and the pectination of the inner edge of the nail of the third toe found in it is no longer to be taken as of much importance in the group. In the second paper a new genus of Strigine Owls is described, from Madagascar, and named *Heliodilus*.

ALGÆ OF THE WHITE SEA.—At a recent meeting of the St. Petersburg Society of Naturalists, M. Chr. Gobi read an interesting paper on the algæ of the White Sea. The number of species he has discovered reaches seventy, of which ten are green algæ, six *Fucus*, and twenty-nine red algæ. The algæ of the White Sea are a mixture of representatives of the Arctic and of the Atlantic basins, as well as of fresh water and salt water forms, the mixed characters of the flora being especially obvious with respect to the green algæ.

GEOGRAPHICAL NOTES

LAPLAND.—An important exploration of Russian Lapland is being carried out by the Swedish lieutenant Sandeberg. Hitherto only the coast of the region has been known with anything like accuracy, the interior features being set down solely from conjecture. Lieut. Sandeberg commenced his work in 1876, and we learn from the *Geographische Blätter* (Heft 1, 1878) of the Bremen Society, it will be continued till 1880. The country will be carefully explored and accurate observations taken, which will enable Lapland to be at last mapped satisfactorily. Lieut. Sandeberg is accompanied by several zoologists who are investigating minutely both the mainland, island, and sea fauna, and have already made considerable additions to our knowledge in this direction. During the last two summers Sandeberg has found seventy-eight new species of birds in the Kola peninsula, of which one at least is stated to be quite new to science. Large collections in other departments have also been made. Previous to Sandeberg, no educated European has explored Russian Lapland, which is of such great importance to the zoologist,

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